damage prevention

**WHAT IS CLAIMED IS:**

quality control / assurance

1. A blockage detector for a system that produces integrated circuit structures on semiconductor wafers, the system having a chamber for placing the semiconductor wafers, the chamber environmentally coupled to a gas source through a gaseous flow path, the detector comprising:

a flow detector, interposed in the gaseous flow path, that determines a flow rate of gas flowing from the gas supply; and

a flow comparator, communicatively coupled to the flow detector, that compares the detected flow rate of the gas to a baseline flow rate of gas, a decrease in the flow rate of the gas indicative of a blockage in the gaseous flow path.

2. The detector of claim 1 wherein the flow detector is a heating element coupled to a power supply, the heating element heating the gas flowing past it.

3. The detector of claim 2 further comprising:

a temperature measuring device, communicatively coupled to the heating element; and

the heating element is enabled in response to a signal from the temperature measuring device.

4. The detector of claim 2 further comprising:

a power measurement device, coupled to the heating element, that measures the amount of power directed to the heating element.

5. The detector of claim 1, further comprising:

a flow controller, communicatively coupled to the gas supply, that controls the flow of gas to the chamber; and

the flow controller changing the flow of the gas supply to the chamber in response to a signal from the flow detector.

6. The detector of claim 1, further comprising:

a control circuitry communicatively coupled to the flow detector, the control circuitry responsive to a predetermined value related to the rate of flow of the gas to the chamber.

7. The detector of claim 6, wherein the control circuitry is programmable.

8. The detector of claim 6, the control circuitry issuing an alarm in response to the detection of a predetermined value.

9. The detector of claim 6, the control circuitry updating a maintenance schedule in response to the detection of a predetermined value.

10. The detector of claim 6, the control circuitry changing the operational status of the system in response to the detection of a predetermined value.

11. The detector of claim 6, wherein the predetermined value is a flow rate.

12. The detector of claim 6, wherein the predetermined value is a rate of change in the flow rate.

13. The detector of claim 6, wherein the predetermined value is based on a rate of change in the flow rate.

14. The detector of claim 1 further comprising:

a second flow detector, the results of the second flow detector allowing the locating of the occlusion.

fault condition identifying capability (assurance control)

15. A system to produce integrated circuit structures on semiconductor wafers, the system comprising:

a chamber for placing the semiconductor wafers;

a gas source, environmentally coupled to the chamber through a gaseous flow path;

a flow detector, interposed in the gaseous flow path, that determines a volume of gas flowing from the gas supply; and

a flow comparator, communicatively coupled to the flow detector, that compares the measured flow of the gas to a baseline flow of gas, a decrease in the flow of gas indicative of a blockage in the gaseous flow path.

16. The system of claim 15 wherein the flow detector is a heating element coupled to a power supply, the heating element heating the gas flowing past it.

17. The system of claim 16 further comprising:

a temperature measuring device, communicatively coupled to the heating element; and

the heating element is enabled in response to a signal from the temperature-measuring device.

18. The system of claim 16 further comprising:

a power measurement device, coupled to the heating element that measures the amount of power directed to the heating element.

19. The system of claim 15, further comprising:

a flow controller, communicatively coupled to the gas supply, that controls the flow of gas to the chamber; and

the flow controller changing the flow of the gas supply to the chamber in response to a signal from the flow detector.

20. The system of claim 15, further comprising:

control circuitry communicatively coupled to the flow detector, the control circuitry responsive to a predetermined value related to the rate of flow of the gas to the chamber.

21. The system of claim 20, wherein the control circuitry is programmable.

22. The system of claim 20, the control circuitry issuing an alarm in response to the detection of a predetermined value.

23. The system of claim 20, the control circuitry updating a maintenance schedule in response to the detection of a predetermined value.

24. The system of claim 20, the control circuitry changing the operational status of the system in response to the detection of a predetermined value.

25. The system of claim 20, wherein the predetermined value is a flow rate.

26. The system of claim 20, wherein the predetermined value is a rate of change in the flow rate.

27. The system of claim 20, wherein the predetermined value is based on a rate of change in the flow rate.

28. The system of claim 15 further comprising:

a second flow detector, the results of the second flow detector allowing the locating of the occlusion.

quality assurance control

29. A method of detecting residue buildup in an apparatus for manufacturing integrated circuit structures on a semiconductor wafer, the apparatus comprising a chamber for placing the semiconductor wafers, and a gaseous flow path for supplying gases used the method comprising:

causing to flow through the apparatus a gas;

determining a volume of gas flowing from the gas supply; and

comparing the flow of the gas to a baseline flow of gas, wherein a decrease in the flow of gas is indicative of a blockage in the gaseous flow path caused by residue buildup.

30. The method of claim 29, the step of determining comprising:
heating the gas with an element coupled to a power supply; and
measuring the power consumed by the element.

31. The method of claim 30, the step of determining further comprising:
measuring a temperature of the gas; and
selectively enabling the element enabled in response to step of the measuring the temperature.

32. The method of claim 29, further comprising the step of:
changing the flow of the gas supply to the chamber in response to a signal from the flow detector.

33. The method of claim 29, further comprising the step of:
detecting a predetermined value; and
selectively initiating an action in response to the step of detecting.

34. The method of claim 33, the step of selectively initiating comprising the step of:
issuing an alarm in response to the detection of a predetermined value based on the step of determining a volume of gas.

35. The method of claim 33, the step of selectively initiating comprising the step of:
updating a maintenance schedule in response to the detection of a predetermined value in the step of determining or in the step of comparing.

36. The method of claim 33, the step of selectively initiating comprising:
changing the operational status of the apparatus in response to the detection of the predetermined value.

37. The method of claim 33, wherein the predetermined value is a flow rate.

38. The method of claim 33, wherein the predetermined value is a rate of change in the flow rate.

39. The method of claim 33, wherein the predetermined value is based on a rate of change in the flow rate.

40. The method of claim 29 further comprising a second flow detector, the results of the second flow detector allowing the locating of the occlusion.

quality assurance

41. A blockage detector for a system that produces integrated circuit structures on semiconductor wafers, the system having a chamber for placing the semiconductor wafers, the chamber environmentally coupled to a gas source through a gaseous flow path, the detector comprising:

for supplying gases used ...

a heating element, interposed in the gaseous flow path and coupled to a power supply, the heating element heating the gas flowing past it;

a temperature-measuring device, communicatively coupled to the heating element, that measures the temperature of the heated gas;

a power measurement device, coupled to the heating element, that measures the amount of power directed to the heating element; and

a flow detection circuitry that determines the flow of the gas past the heating element based on the power consumed by the heating element; and

a flow comparator, communicatively coupled to the flow detection circuitry that compares the measured flow of the gas to a baseline flow of gas.

in order to ... any ... quality assurance ... blockage

42. The detector of claim 41, further comprising control circuitry communicatively coupled to the flow detection circuitry, the control circuitry responsive to a predetermined value related to the rate of flow of the gas to the chamber.

43. The detector of claim 42, wherein the control circuitry is programmable.

44. The detector of claim 42, the control circuitry issuing an alarm in response to the detection of a predetermined value.

45. The detector of claim 42, the control circuitry updating a maintenance schedule in response to the detection of a predetermined value.

46. The detector of claim 42, the control circuitry changing the operational status of the system in response to the detection of a predetermined value.

47. The detector of claim 42, wherein the predetermined value is a flow rate.

48. The detector of claim 42, wherein the predetermined value is a rate of change in the flow rate.

49. The detector of claim 42, wherein the predetermined value is based on a rate of change in the flow rate.

50. The detector of claim 41 further comprising a second flow detector, the results of the second flow detector allowing the locating of the occlusion.